CLAIMS

1. An organic-polymer-based memory element comprising:

two overlapping conductive signals lines; and

at least one organic polymer layer within the region of overlap between the two signal lines, the organic polymer layer having at least two detectable memory states, transitions between which arise from one of changes in chemical bonds and changes in organic polymer doping.

2. The organic-polymer-based memory element of claim 1 wherein, in a first memory state, the organic polymer layer exhibits a first electrical resistivity and wherein, in the second memory state, the organic polymer layer exhibits a second electrical resistivity lower than the first resistivity, the organic-polymer-based memory element therefore an antifuse-type memory element.

3. The organic-polymer-based memory element of claim 2, wherein a memory-state transition is initiated by applying to the organic-polymer-based memory element one or more state-transition-facilitating agents selected from among:

heating;

cooling;

an electrical voltage potential;

a chemical potential;

an electrochemical potential;

electrical current;

electromagnetic radiation; and

a magnetic field.

4. The organic-polymer-based memory element of claim 3 wherein the organic polymer layer includes dopant chemical entities in addition to organic polymers, the dopant chemical entities inactive in the first memory state and active in the second memory state.

5. The organic-polymer-based memory element of claim 3 wherein the organic polymer layer is adjacent to an additional layer within the memory element, the additional layer including dopant chemical entities, a memory-state transition ensuing when dopant entities within the additional layer are driven into the organic polymer layer.

6. The organic-polymer-based memory element of claim 3 wherein organic polymers within the organic polymer layer are disordered, a memory-state transition ensuing when organic polymers within the organic polymer layer align with one another.

7. The organic-polymer-based memory element of claim 3 wherein the organic polymer layer is adjacent to an additional layer within the memory element, the organic polymer layer including cross-linking chemical entities, a memory-state transition ensuing when the cross-linking chemical entities are driven from the organic polymer layer into the additional layer.

8. The organic-polymer-based memory element of claim 3 wherein the organic polymer layer is adjacent to an additional layer within the memory element, the organic polymer layer including polymer-chain-breaking chemical entities, a memory-state transition ensuing when the polymer-chain-breaking chemical entities are driven from the organic polymer layer into the additional layer to restore broken polymer chains to an unbroken state.

9. The organic-polymer-based memory element of claim 3 wherein the organic polymer layer includes cross-linking chemical entities, a memory-state transition ensuing when the cross-linking chemical entities are driven from the organic polymer layer into the additional layer.

10. The organic-polymer-based memory element of claim 3 wherein the organic polymer layer includes polymer-chain-breaking chemical entities, a memory-state transition ensuing when the polymer-chain-breaking chemical entities are deactivated to restore broken polymer chains to an unbroken state.

11. The organic-polymer-based memory element of claim 3 wherein the organic polymer layer includes dopant chemical entities and dopant-inhibiting chemical entities in addition to organic polymers, a memory-state transition ensuing when the dopant entities within the organic polymer layer are deactivated.

12. The organic-polymer-based memory element of claim 3 wherein the organic polymer layer includes dopant chemical entities, wherein the organic polymer layer is adjacent to an additional layer within the memory element, the additional layer including dopant-inhibiting chemical entities, a memory-state transition ensuing when the dopant-inhibiting chemical entities are driven from within the organic polymer layer into additional layer.

13. The organic-polymer-based memory element of claim 3 wherein the organic polymer layer includes a reactant that can add to a carbon-carbon double bond to produce substituted carbons joined by a single carbon-carbon bond, wherein the organic polymer layer is adjacent to an additional layer within the memory element, a memory-state transition ensuing when the reactant from the organic polymer layer is driven into the additional layer to restore broken polymer chains to an unbroken state.

14. The organic-polymer-based memory element of claim 1 wherein, in the first memory state, the organic polymer layer exhibits a first electrical resistivity and wherein, in the second memory state, the organic polymer layer exhibits a second electrical resistivity higher than the first resistivity, the organic-polymer-based memory element therefore a fuse-type memory element.

15. The organic-polymer-based memory element of claim 14, wherein a memory-state transition is initiated by applying to the organic-polymer-based memory element one or more state-transition-facilitating agents selected from among:

heating;

cooling;

an electrical voltage potential;

a chemical potential;

an electrochemical potential;

electrical current;

electromagnetic radiation; and

a magnetic field.

16. The organic-polymer-based memory element of claim 15 wherein the organic polymer layer includes dopant chemical entities in addition to organic polymers, the dopant chemical entities inactive in the first memory state and active in the second memory state, a memory-state transition ensuing when the dopant entities within the organic polymer layer are deactivated.

17. The organic-polymer-based memory element of claim 15 wherein the organic polymer layer is adjacent to an additional layer within the memory element, a memory-state transition ensuing when the dopant entities are driven from within the organic polymer layer to the additional layer.

18. The organic-polymer-based memory element of claim 15 wherein organic polymers within the organic polymer layer are aligned, a memory-state transition ensuing when the organic polymers are disordered with respect to one another within the organic polymer layer.

19. The organic-polymer-based memory element of claim 15 wherein the organic polymer layer is adjacent to an additional layer within the memory element that contains cross-linking chemical entities, a memory-state transition ensuing when the cross-linking chemical entities are driven from the additional layer into the organic polymer layer.

20. The organic-polymer-based memory element of claim 15 wherein the organic polymer layer is adjacent to an additional layer within the memory element that contains polymer-chain-breaking chemical entities, a memory-state transition ensuing when the polymer-chain-breaking chemical entities are driven into the organic polymer layer from the additional layer.

21. The organic-polymer-based memory element of claim 15 wherein the organic polymer layer includes cross-linking chemical entities, a memory-state transition ensuing when the cross-linking chemical entities are activated.

22. The organic-polymer-based memory element of claim 15 wherein the organic polymer layer includes polymer-chain-breaking chemical entities, a memory-state transition ensuing when the polymer-chain-breaking chemical entities are activated.

23. The organic-polymer-based memory element of claim 15 wherein the organic polymer layer includes dopant chemical entities and dopant-inhibiting chemical entities in addition to organic polymers, a memory-state transition ensuing when the dopant entities within the organic polymer layer are activated.

24. The organic-polymer-based memory element of claim 15 wherein the organic polymer layer includes dopant chemical entities, wherein the organic polymer layer is adjacent to an additional layer within the memory element, the additional layer including dopant-inhibiting chemical entities, a memory-state transition ensuing when the dopant-inhibiting chemical entities are driven into the organic polymer layer from the additional layer.

25. The organic-polymer-based memory element of claim 15 wherein the organic polymer layer is adjacent to an additional layer within the memory element that includes a reactant that can add to a carbon-carbon double bond to produce substituted carbons joined by a single carbon-carbon bond, a memory-state transition ensuing when the reactant is driven into the organic polymer layer from the additional layer.

26. The organic-polymer-based memory element of claim 1 wherein, upon application of a switch, the memory element irreversibly transitions from the first memory state to the second memory state.

27. The organic-polymer-based memory element of claim 1 wherein, upon application of the switch, the memory element reversibly transitions from a first memory state to a second

memory state under, subsequently transitioning back to the first memory state in response to application of a second switch.

28. A two-dimensional memory array fashioned from memory elements of claim 1.

29. An electronic device containing the two-dimensional memory array of claim 28, switching between memory states of the memory elements of the two-dimensional memory array to store data values.

30. A three-dimensional memory array fashioned from memory elements of claim 1.

31. An electronic device containing the two-dimensional memory array of claim 30, switching between memory states of the memory elements of the three-dimensional memory array to store data values.

32. A computer system comprising:

a processor; and

a memory comprising a number of memory elements of claim 1.